THE MODEL ENGINEER

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The MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● THIS PHOTOGRAPH, submitted by Mr. Laurence W. Cox, depicts a scene familiar to nearly all our readers—the model engineer, in his home workshop, concentrated on the intricacies of a turning operation in progress. Many amateur photographers who have attempted to portray a similar subject will be aware that it is not an easy one to do justice to, but this effort has succeeded in combining a good portrait study with unusually good fidelity to technical detail. Unfortunately, the nature of the work being dealt with cannot be seen in the photograph, but readers will recognise an old friend in the type of lathe employed; namely, the 4-in. round-bed Drummond, an old favourite among model engineers, which, although no longer in production, is still giving good service in many amateur workshops.—E.T.W.

Australian Opportunity

● WE HAVE often drawn attention to the bond of common interest existing between model engineers the world over, and many are the stories we have told of friendly help offered by one reader to another whose problems have been published in our pages.

Yet another instance now comes to light, and it is no small satisfaction to us that we have again been instrumental in bringing fresh opportunities to one of our readers and his family.

Just over a year ago, with the permission of both, we put one of our Brighton readers in touch with a reader in Australia.

We now hear from our Australian reader, who writes :—

"From that beginning a regular correspondence developed, and it happened that I was able to offer Mr. W— a position in Melbourne and also to sponsor his migration under the free passage scheme. I am happy to say that these plans are now very near fruition, as he, together with his wife and two small children, are at sea on their way to Australia.

"My point in writing to you is twofold; first, to acquaint you of the manner in which you have assisted these people to achieve an ambition, and second, to say that I am prepared to repeat this sponsorship for at least one more family. Unfortunately, I cannot undertake to do so for more than one family at a time. If, therefore, you should have the opportunity to make this known, it may develop as happily as in the case of the W—— family.

"I would prefer in this case, a young man

under 30, married, with or without family, and who has some engineering trade experience. This experience would be most suitable, if obtained through an indentured apprenticeship. I will deal expeditiously with enquiries from anyone genuinely interested.

"Would you please withhold my name from any published references you may wish to make in this regard.

"In conclusion, let me add my appreciation for the splendid material in THE MODEL ENGINEER."

In accordance with our Australian reader's request, we will forward to him applications from readers at home whose qualifications coincide with those stated in his letter.

Envelopes should be addressed c o The Editor, THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2, and marked with the word "Opportunity" in the lower left-hand corner.

—P.D.

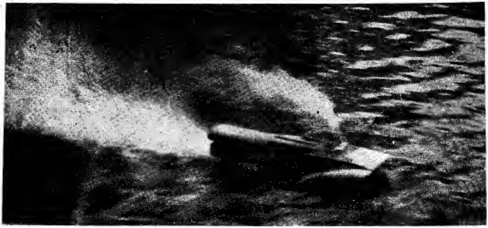
The Late Mr. W. Whiting

● AMONG MODEL power boat enthusiasts in the London area, few were more active, or more popular, than Bill Whiting, whose recent death will be deeply regretted by all who knew him. His model power boat career began many years ago, in the pioneer days of the West London Model Power Boat Club, and he was also associated with the formation and early progress of the Model Power Boat Association. Some years later, he came to live in the southern outskirts of London, where he quickly made contact with other model engineers in the locality, and the outcome of this was the formation of the Orpington Model Engineering Society, which made rapid progress under his guidance as its first secretary. His best-known boat was the steam yacht *Rose Marie*, a realistic model of a very handsome prototype, which has been featured and illustrated in more than one regatta report published in THE MODEL ENGINEER; but he has built several other successful boats, including tugs, cabin cruisers and speedboats, besides having a keen and active interest in every branch of model work. For some time past, his health had been very precarious, but his enthusiasm was undiminished, and until quite recently, he rarely failed to put in an appearance at regattas and society meetings. His two sons have inherited his interest in model engineering, and I have every reason to hope that they will follow in his footsteps.—E.T.W.

The "M.E." Index

● ANOTHER VOLUME of THE MODEL ENGINEER has now been completed and we repeat our offer to supply subscribers and regular readers with the index for Volume 99, if they will send us a stamped addressed envelope (1d.) of sufficient size to take a copy of the journal flat. The index will not be printed until we know how many copies are required to fill the demand, but readers are requested to make early application to the Sales Manager, THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.—W.H.E.

Mr. W. Whiting with his model steam tug "Dominant"



Boats that go Forwards

An Epitome of Model Power Boat Progress during the past Season

by Edgar T. Westbury

LAST year, readers may remember, I took it upon myself to deliver a somewhat sharp sermon on the lack of progress in model power boats, under the heading "Boats that go Backwards." The immediate reaction to this among enthusiasts was a good deal of pond-side and club-house discussion, and although little of this found its way into print, in the correspondence columns of THE MODEL ENGINEER, I have good reason to believe that it had the desired effect in focusing attention on many details which were tending to hold up progress. My remarks, I am glad to say, were generally accepted in the right spirit, and no personal innuendoes were imagined where none were intended. In short, my homily was taken in the way it was offered—as a spur, and not a scourge; and whether as a result of its direct application or not, the events of this season have presented a very different picture.

Yes, the 1948 season has definitely been one of good general progress; both the old hands and the newcomers have put in some really good work, and fears of a stalemate through stagnation of ideas or flagging of effort have been happily dispelled. There have been many spectacular performances during the season, and record claims in all classes have been submitted to the M.P.B.A. for recognition; but records, gratifying as they are, are not the most important thing in model power boating. In this, as in all other aspects of model engineering, it is the effort that counts, and there is little to complain about on that score. Not only among the racing classes of boats, but in all others, there has been a reawakening of interest, and plenty of keen competition; last but not least, the purely personal side of model sport has been highly satisfactory, and relations between clubs and individual competitors were never better. So, as I have nothing but pats on the back to deliver on this occasion, it will not be necessary for me to take studious pains to avoid mentioning names, as I did last time. But do not take my words to mean that we have arrived at a perfect Elysium of complacency in the model power boat world; this is no time to rest on our laurels—such as they are—but (to indulge in a slight misquotation of Shakespeare) "with furbished arms, and fresh supplies of men, begin a fresh attack."

Tethering Methods

The past season has seen at least one very important innovation in the running rules for model speedboats—namely, the adoption of the "bridle" method of tethering, instead of rigid adherence to the single-point attachment, as previously specified in M.P.B.A. rules. As there is still some misapprehension about this, however, a few words on the subject will not be inappropriate. The use of the bridle does not, as some querists seem to think, compel competitors to abandon single-point attachment if they have found it satisfactory and fear the effect of an alteration. It merely provides a much greater flexibility in the choice of methods of attachment, and enables boat designers to take full advantage of the benefits, if any, to be derived from the use of the two-point attachment which has long been used for model speedboats in other countries.

Mr. J. Cruickshank refuelling "Defiant III." (10 *c.c.*)

According to present M.P.B.A. rules, the tethering line is now made shorter than previously, and the balance of the length required to produce the standard lap circumference is made up by a "bridle," furnished by the competitor to suit his boat; this may be attached to the latter at one, two, or any number of points at his discretion, provided that it brings the point of attachment to the line to the specified minimum distance from the centre line of the boat, and satisfies the specified safety regulations. Thus nobody is obliged to use two-point attachment, and the older method is still used and favoured by some competitors; but the new method avoids confusion, or the necessity to change over tethcring lines, for dealing with individual preferences in this respect. Incidentally, to clear up another query on circular-course running, it may be remarked that the "standard" lap distance in M.P.B.A. events is 100 yards *where possible*; but some ponds are not wide enough to allow of running this distance, and a shorter line may be used, so long as the exact radial distance is measured and properly attested to. I trust that these remarks will not involve me in a spate of queries (such as I have often received in the past), as to the exact length of line required for a given lap distance; surely the "mathematics" of this problem are not beyond anyone with an elementary school education!

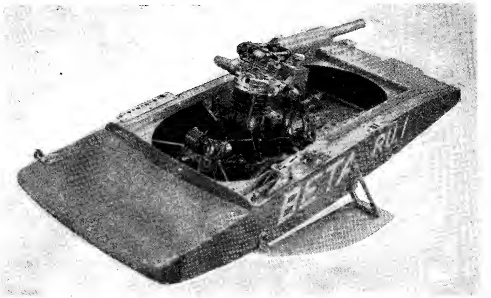
Surface Propellers

With the advent of the "bridle" method of tethering, it has become possible to experiment with the surface propeller—which was quite impossible with single-point attachment—and many competitors have taken advantage of this facility, in some cases with very good results. This is another point on which many queries have been received, so it may be stated that the idea of the surface propeller is by no means new, having been the subject of many experiments in the past, but it has recently attracted much attention because of its spectacular success in America. It consists in the use of a propeller of fairly normal design, but usually increased in all essential dimensions, which instead of being completely submerged below the surface of the water, is so situated that under planing conditions it is practically half out of the water, only the lower half being immersed sufficiently to be effective in propulsion. Despite the fact that this flouts many of the established rules of marine propulsion, there is no question that it works—and to such good effect that it is now fitted to many record-breaking boats.

The practical advantages of the surface propeller are, first, that it enables a propeller of larger blade area and pitch to be employed than would otherwise be possible, with a given size of engine. It is probable that the actual propelling efficiency may be lowered, and the slip considerably increased, at least during acceleration, but cavitation in the true sense does not occur (as a matter of fact this term is much used, but little understood, in model power boat circles) because formation of a partial vacuum in

Mr. K. Williams with "Faro" at the Bournville Regatta. A new 30-c.c. speed record is claimed for this boat

the region of the propeller is impossible. A two- or three-bladed propeller in these circumstances only uses one blade effectively at a time, so blade interference is cut down. Secondly, the propeller shaft and stern bearing, which when submerged account for a good deal of the total drag of the hull, are raised practically clear of the bridle in their efforts to follow their natural inclinations gives an impression which is by no means reassuring, and the old principles of trying to give a boat some inherent stability seem to have been outmoded. Instead of letting a good horse have his head and make his own pace, we flog him hard and drag him round by the bit!



One of the most promising new boats, Mr. Mitchell's "Beta," the 15-c.c. engine of which outclassed all the 30-c.c.'s at the Grand Regatta

water and their resistance almost completely eliminated. Further, in the most successful examples of surface-propelled boats, the rear plane (if any) rises quite clear of the water, with further reduction of drag, but this depends very largely on the design and weight distribution of the hull.

There are, of course, some disadvantages of the surface propeller; one of them is that its effective use is only possible with a light boat of extremely high power/weight ratio. A beginner with a not too efficient engine may never get to first base with a surface propeller, as the hull would just plough along and never get its tail up at all. It is essential that the hull should reach planing speed immediately, and this may demand some skill in launching to attain this end. Many surface-propelled boats are "dirty" runners, throwing up enormous quantities of water, which makes one wonder just how much power is being wasted in this way; and some plane in a most precarious fashion, which is far removed from the smooth, easy glide one expects from a good hydroplane. It is, of course, quite obvious that, as only the lower part of the propeller is in action, this produces a side thrust tending to slew the boat round against the direction of propeller rotation; and it is only prevented from thus turning—and incidentally, overturning—by the tethering bridle rigidly attached at both bow and stern. The way some boats literally "fight" the

From these remarks, readers may conclude that I am by no means "sold" on these new-fangled notions, the bridle tether and the surface propeller; and to some extent they are right. Is it just a case of die-hard pigheadedness—an old dog refusing to learn new tricks? I hope this will never truly be said of me—for I regard all new developments as things to be carefully watched, and given a fair trial. But I have always believed that there are many ways of "exterminating a *felis domesticus*," and I do not, without a good deal of further evidence, believe that these developments are the one and only way to perfection, or that they produce better results than might possibly be attained in other ways. Personally, I am of the opinion that better attention to carburation and certain other details of engine design would have enabled users of submerged propellers to avoid many of their inherent troubles, such as stalling when getting under way; and that attention to the finer points of hull design would produce better natural stability, rather than the false, artificial methods which seek forcibly to prevent deviation from the true course or attitude of the hull.

Modern hulls, especially those with surface propulsion, tend to have coarser planing angles than formerly, and the use of false planing surfaces attached to flat-bottomed hulls, also the use of side planes, in forms variously known as "sponsons," "pontoons," and "skates," has been

exploited in every conceivable way. One of the most successful new record-breaking boats of the year has practically a double hull, or "catamaran," and this idea has been tried out by several designers in recent years. I believe, however, it is a fallacy to consider only the salient features of hull design as important factors in success; the lessons of the past have shown that widely varying types can be equally successful, and that efficiency may depend more upon details and adjustments than features which are obvious and spectacular. Planing angles and areas, position of step, centre of gravity, thrust line and so on all have to be carefully related to each other, also to the weight and available power; and there are little data available to assist the experimenter in these problems. Neither is there much known about the details of propeller design, a problem on which I am constantly being consulted by novices thirsting for information.

For a happy combination of good worksmanship, finish and high performance, Mr. E. Clarke's 30-c.c. engine in "Gordon" deserves special mention

No doubt certain types of engine, particularly open-port two-strokes, are allergic to any interference with the free escape of exhaust gases, but there are many avenues of design which offer prospect of quiet running in conjunction with efficiency, and the exploration of these, though it may take time, will undoubtedly lead to real progress—and indeed may eventually be the deciding factor in the success of model speed boats, and other forms of model sport.

Silencing

Another development to which much attention has been given during the past season is the attempt to make boats run quieter, with a view to removing annoyance to the public, which has been the subject of an increasing number of complaints. This raises some very difficult problems, not only in the application of effective silencing measures to engines with the minimum interference with their efficiency, but also in assessing or measuring the sound produced; and in neither respect can it be said that results so far obtained are as yet highly satisfactory. But a promising start has been made, and some interesting facts have emerged, which if not entirely a new revelation, were at least not commonly realised or believed.

It has, for instance, been definitely proved that speed and relatively quiet running are not incompatible, as the winner of the silencing prize in the Grand Regatta, Mr. Mitchell's *Beta*, was also the fastest boat of the day. Another boat, Mr. Walker's 15-c.c. *Petite*, which made two runs, with and without the silencer fitted, returned almost exactly the same speed for both runs. It is true that the latter was not a highly-tuned boat, and these isolated examples do not constitute a conclusive test, but the results are promising, and the M.P.B.A. have decided to continue and intensify the silencing campaign.

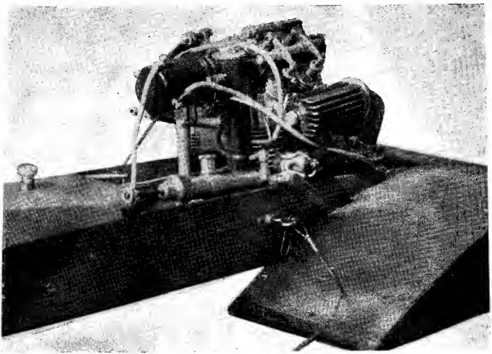
Engines

Few really new developments have taken place in engine design, and both two-strokes and four-strokes are popular, though the development of the former type seems to be in danger of passing out of the hands of the amateur, which I personally should be very sorry to see. The single-cylinder engine still reigns supreme for racing boats, the one solitary exception to this rule being the 30-c.c. twin supercharged engine by Mr. B. Miles, of the Malden Club, which after a long period of teething trouble, seems at last to be showing that it really has "got something." I have heard of some very high speeds attained with this engine in its unusual shaped "flying T-square"—but no official results have been given so far. There is no doubt whatever that such an engine, with effective supercharging, can be made to produce a colossal power output, but its weight and complication are liable to be a handicap.

Engines are still much too temperamental, and seem perversely determined to save up their most mysterious faults for special pond-side occasions, but most 1948 regattas have been fairly immune from those epidemics in which one boat after another has either failed to start, or petered out before finishing the course. The average standard of regatta performance—which I consider far more important than the spectacular high spots, from the point of view of general progress and popular appeal—has been higher than at any time since the war, in spite of the fact that some regattas have been run under very difficult conditions, climatic and otherwise. It may be said that there has been little alleviation of the problems and restrictions which confront the engine constructor, whether he essays to build petrol engines or flash-steam plants; but good progress has been made in both spheres. Flash steam has retained its popularity, and

also its success, though not exhibiting sweeping superiority over petrol engines in any particular regatta, as it did last year. With the exception of a new and very promising "C" class boat, *Zephyr*, by "Tornado" Martin, of Southampton, there have been no very striking developments in new design or construction.

this boat from regattas is only temporary. Among others of the "Water-'Otter" fraternity, the most consistent record of success this year has been scored by the Jutton brothers, of Guildford, whose boat *Vesta* has won a unique succession of first prizes; but believe me, these have not been mere strokes of luck, as anyone who has followed the



Mr. B. Miles' 30-c.c. supercharged twin engine in a hull of unusual design

career of this highly spectacular boat will bear witness. Mr. Pilliner's *Ginger*, which is also a Guildford boat by origin, though now under the banner of Southampton, has also had one or two well-deserved successes, and the same applies to Mr. Martin's fleet of flash steamers from the latter club.

Personalities

Repeating the platitude that it is effort that counts, I propose to deal with model power boat personalities purely from this angle. The man who really works hard, often against difficulties and ill-luck, both deserves and needs a word of encouragement, but only too often fails to receive due recognition, when all the limelight is focused on the lucky winner. If, however, success is achieved—as it should be—as the result of long and patient effort, it is equally commendable, and I shall deal with it accordingly.

Among the triers, whose lucky star has not been in the ascendant this year, I rate very highly Mr. George Lines, of Orpington, whose boat *Blitz IV*, shown in the photograph at the heading of this article, despite obvious capabilities, has not been on its best behaviour on the most important occasions. Like most flash steamers, it has a very pronounced temperament of its own, but both in design and construction, it embodies qualities which deserve success, and will, I hope, attain it eventually. Our old friend *Ifit* has been inactive for most part of the year, the exact reason for which I do not know, but I hope that the absence of

The users of petrol engines who deserve mention from this aspect include Mr. E Clarke, of Victoria, whose long record of patient but ill-rewarded endeavour was at last brought to fruition by the success of *Gordon* in the International Regatta. Unfortunately, however, ill-health has persistently dogged his footsteps, and I understand it has now caused his retirement from this sport; temporarily only, I hope. Mr. S. H. Clifford, of the same club, is still persevering, and his work, both in design and production, is really brilliant. A mixed bag of success and failure has been scored by Jim Cruickshank with his *Defiants*—four of which have now been built, the first being a flash steamer and the others fitted with two-strokes. There are few better exponents of the design and construc-

(*Continued on page* 695)

IN THE WORKSHOP

by "Duplex"

27—Hacksaws and Hacksawing

IN the small workshop the hand hacksaw is not only used almost exclusively for cutting off pieces of material, but, in addition, it is largely employed for cutting parts to shape prior to finishing them by a filing or machining operation.

In view, therefore, of its great utility, when properly used, it may not be out of place to describe, more particularly for the benefit of the novice, the choice of proper sawing equipment and, briefly, the method of using it.

This inevitably entails reference to toolmakers' catalogues and quotation from their recommendations, for they are after all, perhaps, in the best position to offer advice concerning their products; nevertheless, the small user often has his special difficulties that experience alone will enable him to overcome.

At the outset, it should be recognised that, to obtain a satisfactory result, a blade suitable for the work in hand is essential; and although this may entail providing several varieties of blades, the same applies to the use of files, where a large selection is usually found necessary to cover the ordinary range of work.

It would be intolerable to have to fit a handle to a file every time it were used, and it is certainly irksome to adopt the practice of changing the hacksaw blade in the frame to suit the work. As an alternative, therefore, several frames can be kept fitted with blades appropriate for all general work; and although the initial outlay may be greater, this will go far to ensure that the right blade for the job is always used, with a corresponding reduction of expenditure for broken and damaged blades.

Hacksaw Frames

As will be seen in Fig. 1A, the lighter patterns of hacksaw frames have a horizontally-placed file-type of handle; this assists light and accurate sawing, but for heavier work a more substantial form of frame will be found an advantage.

The Starrett-pattern hacksaw frame, shown in Fig. 1B, is of robust construction, and the pistol-grip handle affords a firm hold and, at the same time, allows adequate pressure to be applied during the cutting stroke with the wrist held in its strongest position. Further, the frame is adjustable to take blades of from 8 in. to 12 in. in length, and the collar fitted to the tensioning-nut ensures a comfortable hold for the fingers when the frame is grasped close to the blade.

In both these types of frames the blade can be mounted either in line with or at right-angles to the plane of the bow.

The standard fixed form of frame formerly in common use in the small workshop takes a blade 8 in. in length, but unfortunately these blades appear to be no longer manufactured in this country, and imported blades are at present

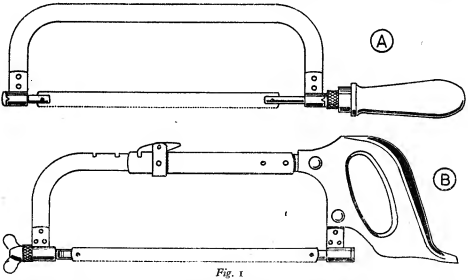


Fig. 1

unobtainable; instead, 9-in. blades are the shortest now available, and these are of rather greater breadth to give increased rigidity.

Those who, like the writers, have a number of the shorter frames may, therefore, prefer to adapt them to take 9-in. blades rather than go to the expense of buying replacements; moreover, many may want to revert to using 8-in. blades for light work when they again become obtainable.

The Millers Falls 8-in. fixed frame can be converted, as shown in Fig. 2, to take 9-in. blades. This is done by filing the squared portion of the forward tensioning-screw to allow it to slide further into its housing, and, in addition, a new peg is fitted to the rear attachment spindle as close as possible to the frame; should the frame be later required for holding 8-in. blades, it will then only be necessary to fit a new peg in the original position.

Where a wing-nut is fitted for adjusting the tensioning-screw at the forward end of the frame, as illustrated in Fig. 2A, a more comfortable finger grip will be obtained if a collar is fitted between the nut and the frame, or if a shouldered nut is substituted, as shown in Fig. 2B.

In the case of the Goodell-Pratt and fixed-frame Starrett saws depicted in Fig. 1A, there is insufficient room within the frame for a 9-in. blade, and it will, therefore, be necessary to fit an extension-piece, as shown in Fig. 3, to either the forward or the rear limb of the frame. To do this, the clip holding the tensioning-screw is freed by removing the two rivets seen in Fig. 3A; the rivets should be punch-marked as nearly centrally as possible, and a centre-drill mounted in the drilling-machine is fed in until the heads of the rivets become detached; the rivets can then be punched out. The extension-piece is formed from a length of mild-steel of the same width and thickness as the bow of the frame—usually $\frac{3}{8}$ in. × $\frac{3}{16}$ in.

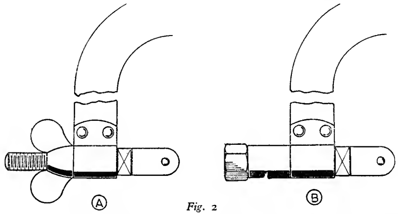


Fig. 2

Both the extension-piece and the end of the limb of the frame are filed to half-thickness as shown in Fig. 3C, and the slip is riveted first to this piece and then to the frame itself, as represented in Fig. 3B.

If no suitable rivets are available, they can easily be turned to size and parted off from a length of mild-steel rod held in the lathe chuck.

On completion of the work, it may be found necessary to file away the lower edge of the limb for about $\frac{1}{16}$ in. to allow the saw blade to pass.

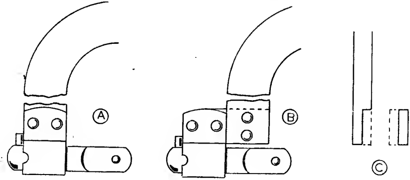


Fig. 3

Hacksaw Blades

The Eclipse series of blades are made of either tungsten-alloy steel for general use, or of high-speed steel for cutting stainless and other alloy steels. These high-speed steel blades will be

found essential for cutting some of the tougher alloy steels, and they will, moreover, give longer service than the other variety when used for hacksawing ordinary tool- and silver-steel.

Two varieties of the ordinary tungsten-steel blades are made: either they are hardened all over, or the teeth alone are hardened, and the remainder of the blade is left soft and flexible in order to reduce the risk of breakage in the hands of the less-skilled worker. In addition, the latter type of blades are manufactured with fine teeth formed on both edges, and their double width gives better guidance when cutting rods and tubing.

For use in hand-frames, all these blades, with the exception of the double-edged variety, are made ½ in. in width and in lengths of 9, 10 and 12 in. The pitch or number of teeth per inch is standardised at 14, 18, 24, and 32, and the thickness of the blade is 23 gauge or 0.024 in. in all cases.

The drawing, Fig. 4, illustrates the manner in which these measurements are made, and it should be noted that the length of the blade is taken from the outer edges of the two mounting holes and not from their centres.

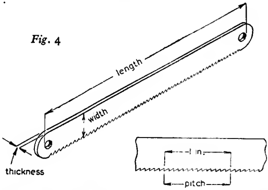


Fig. 4

Using the Hacksaw

The first essential is to choose a blade of correct tooth-pitch for the work in hand, bearing in mind that if the teeth are too fine they will tend to become clogged, particularly by the curled chips formed when sawing mild-steel; on the other hand, teeth of too coarse a pitch are easily fractured if used to cut thin material, for the stress may then fall on a single tooth, whereas at least two teeth should always be in contact with the work.

The illustration in Fig. 5 should make clear the effect of using blades with coarse and fine teeth when sawing different forms of material.

When fitting the blade to the frame, the teeth should point forward, and the tensioning-screw should be turned until the blade gives out a clear musical note when plucked with the finger nail; then look at the line of the blade as seen from the back of the frame, and if the blade appears to be twisted, turn back the tensioning-screw a small amount until the twist is removed.

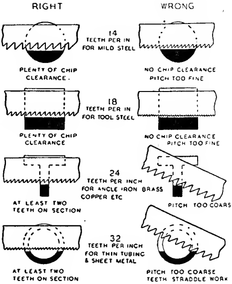


Fig. 5

Prior to the actual sawing operation, the work should be accurately marked-out so that, when it comes to finishing the part to size, time and labour are not wasted in removing an excessive amount of unwanted material. A second guide-line should be scribed rather more than the breadth of the blade away from the actual dimension-line; the sawing operation will then be facilitated by working mid-way between these two lines.

The work must be firmly secured in a rigid vice and should not project beyond the vice jaws more than is necessary, otherwise the resulting vibration, besides causing unnecessary noise, will damage both the work surface and the saw blade itself.

It is important that the cut should be started correctly as shown in Fig. 6, for if the teeth are brought into contact with a narrow or a vertical edge, they will be easily broken; further, only light pressure should be used at starting, particularly in the case of a new blade, which will tend to cut rather fiercely.

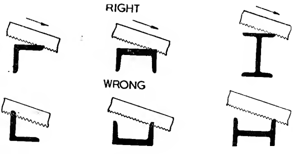


Fig. 6

After a start has been made, the cutting strokes, when sawing steel, should be maintained at the rate of not more than 50 per minute, so as to avoid overheating the teeth.

Downward pressure must be exerted during the forward stroke to ensure that the teeth bite into and cut the material, for if the blade is allowed to worn, a little oil applied to the blade with a brush will ensure free working. If the blade is changed during the sawing operation, start the cut again in a fresh place, for a new blade with unworn teeth will tend to jam in the previous cut and will thus have its set worn away unduly quickly.

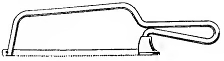


Fig. 7

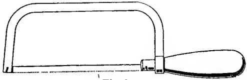


Fig. 8

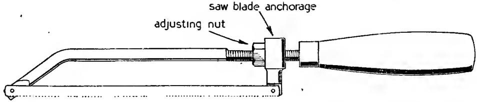


Fig. 9

slide over the surface of the work the teeth will quickly become blunted. On the backward stroke the downward pressure is relaxed, but the blade must not be actually lifted in the cut.

As the blade becomes worn it will be necessary to increase the downward pressure to maintain free cutting, and should the blade tend to jam in the work, owing to the set of the teeth becoming

Special Hacksaws

The original Thompson pattern hacksaw is now manufactured as the Eclipse Junior saw, which is illustrated in Fig. 7. The frame is formed from spring-steel in order to impart tne necessary tension to the blade when it is sprung into place. The 6-in. blade is ¼ in. in width and has 32 teeth per inch. Formerly, these blades

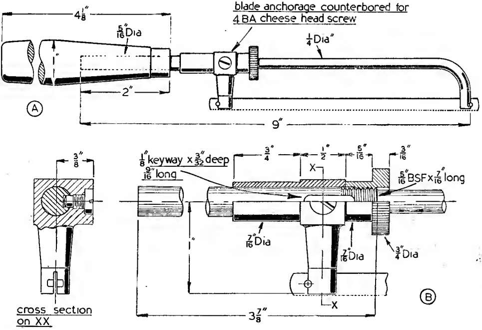


Fig. 10

were made with single teeth set alternately to the right and left, and the kerf cut by the saw measured 24 thousandths in width; but at present, only blades with a wavy form of set are obtainable, and these, we find, cut a kerf 30 thousandths wide. The thinner blades cut with less pressure than the thicker pattern, and in the light frame seem better adapted for cutting metal, as they are not so liable to be deflected under the cutting pressure applied.

As the thin blades are so useful for fine sawing, for slotting the heads of small screws, and for rapidly cutting through steel rod, it is hoped that they will again become available.

Since writing the above, we find that an Eclipse frame of the form shown in Fig. 8 has been introduced. This is a much more rigid type of frame than the foregoing, and the blade can be correctly tensioned by turning the pear-shaped handle.

When using this frame, fitted with a blade of the wavy-set form, we found it excellent for accurately sawing small work, and the previous tendency for the blade to twist in the cut was no longer experienced.

Another form of small hacksaw frame to take 6-in. blades is shown in Fig. 9; here, the rear end of the blade is anchored to a component which is moved along the frame by means of an adjusting-nut to set the blade tension. The threaded portion of the frame has a flat formed on its under surface to engage the D-shaped bore in the anchor-piece and so prevent it turning out of line.

The writers have elaborated this simple but useful form of frame by fitting an anchor-piece with a long bearing, which prevents binding, and also enables the blade to be tensioned by means of a knurled finger-nut.

The general arrangement of the saw is shown in Fig. 10A and the detailed construction of the tensioning device is illustrated in Fig. 10B. The anchor-piece, which slides on the unthreaded portion of the frame, is prevented turning by a 4-B.A. screw fitted with its end engaging in a keyway formed in the frame. When making the frame, it will be seen that much of its length must be reduced from $\frac{5}{16}$ in. to $\frac{1}{4}$ in. diameter; this can readily be done in the lathe if the back centre is engaged in the work and the travelling steady is used to give additional support.

The 4 B.A. set-screw shown should, preferably, be specially made with a plain portion at its end to engage the $\frac{1}{8}$-in. keyway end-milled or fly-cut in the frame.

The slots in the frame to receive the blade should be cut either with a circular milling-saw or with a non-wavy type of hacksaw blade in order to afford a close fit for the blade when mounted in place.

The tensioning-nut must be slipped on the frame before the bending operation is carried out. The frame should be brought to a red heat to allow an even curve to be formed when it is bent round a piece of bar held in the vice.

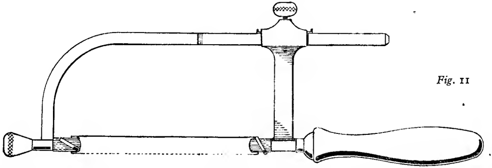


Fig. 11

To make the handle, either an ordinary chisel handle can be used or, if preferred, it can be turned from ebonite or plastic material.

The compact design and increased rigidity add greatly to the utility of this small saw.

A still smaller form of hacksaw is the jeweller's or slitting saw shown in Fig. 11. These frames are made to carry blades $5\frac{1}{4}$ in. long and ranging in width from $\frac{1}{8}$ in. to $\frac{1}{2}$ in.; the pitch of the teeth is 36 per in. and the width of the kerf cut is only 15 thousandths.

The deeper blades give good guidance when forming slits in tubes and other material, and the thinness of the blades makes them invaluable for slotting the heads of small screws.

In addition to slitting blades, piercing saws can also be mounted in this type of frame.

Piercing Saws

When carrying out pierced work in sheet metal, a narrow blade rather like a fretsaw blade is mounted in a frame of the type just described. Two models of Eclipse piercing-saw frames are made: one adjustable to take blades up to 6 in. in length, and the other fixed for use solely with 5-in. blades.

The Eclipse piercing-saw blades are made in a graduated series ranging from 6 to 17 thousandths in thickness and with pitches of from 80 to 32 teeth per inch.

The makers recommend that the finest blade be used for cutting material up to 15 thousandths in thickness, and the heaviest blade can be employed for sawing metal of $\frac{1}{16}$ in. thickness and over.

When using these blades, in order to obtain the best results, it is important that the makers' issued instructions should be carefully followed.

Before leaving the subject of hand hacksaws, the Abrafile, which is a form of piercing saw, should be mentioned, as it will be found a most

useful workshop tool for cutting curved profiles and for slotting enclosed holes.

The frame is made of spring-steel for tensioning the blade when sprung into place, and the blades themselves are similar to fine round files. The teeth in the three grades of blades obtainable are formed to cut rapidly and with the application of light pressure only. If preferred, the standard blades can be mounted in an ordinary hacksaw frame with the aid of the special links illustrated in Fig. 12.

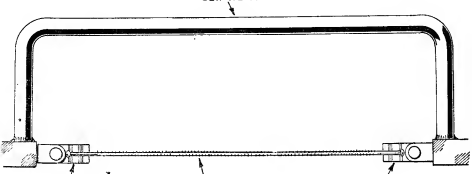


Fig. 12

Slotting Screw-heads

The various types of blades described will cut slots ranging from 6 to 30 thousandths in width, which should serve for most screws in general use, but for forming slots in screw-heads and other works, sets of 8 in. blades can be obtained in various thicknesses up to $\frac{1}{8}$ in.

When slotting screw-heads with the hand-saw, the central pimple remaining after parting-off should be utilised as a guide for directing the saw-cut through the exact centre of the head.

Boats that go Forwards

(*Continued from page* 689)

tion of these engines than he is, and his versatility is proverbial; I hear rumours that he may try his hand with a four-stroke, and something out of the rut in design, too.

Proof of the old adage that "there's life in the old dog yet" comes from several quarters; notably, the efforts of Mr. K. G. Williams, of Bournville, with *Faro*, show that pre-war boats are neither outworn nor obsolete. Mr. Walker, of Malden, continues to score modest but well-deserved successes with the docile and dependable *Gilda* in the 30-c.c. class, while his 15-c.c. plodder *Petite* gives him a useful second string.

Of the newcomers, Mr. Mitchell, of Runcorn, has made an immediate and noteworthy success with his 15-c.c. boat *Beta*, which is one of the nicest boats to watch in motion, and does not shatter the ear-drums, despite the fact that it is really fast, and produced the highest speed of the day at the Grand Regatta. Here again, success is no mere accident. Late in the season, we have seen some very spectacular progress made by Mr. G. H. Stone, of Malden, with *Lady Babs II*, the original hull design of which certainly seems to be highly efficient and stable.

Although not, strictly speaking, a member of the British model power boat fraternity, readers will, I feel sure, agree that inclusion of Monsieur G. M. Suzor as "one of us," and also one of the worthiest of triers, is justified. Suzor has had one of the longest careers in this sport, and has always been an outstanding personality. He has not always been lucky, but win or lose, has always had something interesting and original to contribute to progress. Last year he surprised us with the ingenuity, and no less the high performance, of his 10-c.c. boat *Mlle Sylla*; this year, in addition to further success with the same boat, he sprung a surprise by his change over to a four-stroke engine in his 30-c.c. boat *Nickie* 8.

Concerning the innumerable other worthy triers whom I have not mentioned by name, I trust that they will not consider the omission intentional, or as tending to point to odious comparisons. As a matter of fact, the year's progress has been largely a matter of real team work by all and sundry. I feel that in this respect much credit is due to the committee of the M.P.B.A. for the pains taken to keep in touch with modern ideas and requirements, and particularly to the Hon. Secretary, Mr. J. Benson, whose hard work in the administration of affairs has had much to do with the expansion of the Association, which now includes a greater number of affiliated clubs than ever before.

A 3-in. Gauge L.M.S. Class 5 Loco.

by "L.B.S.C."

As the staying of "Doris's" boiler is carried out in the same way as fully described just recently for "Maid of Kent" and "Minx," there is no need to detail out all the ritual again; so I will just call attention to the variations, where they exist. The three longitudinal rod stays are made from 3/16-in. copper rod, screwed 3/16 in. by 40 at the ends; the blind nipples are turned from 3/8-in. hexagon brass rod, drilled 5/32 in. or No. 22, tapped 3/16 in. by 40, turned to 5/16 in. diameter outside, and screwed 5/16 in. by 40. The screwed part need only be about 5/16 in. long, with 1/8-in. heads. The blower-valve, to which the footplate end of the hollow stay is attached, can be made to the drawing and notes starting on page 433 of the issue of October 21st last, the only difference being that the part which screws into the boiler is screwed 3/16 in. by 40, and drilled No. 13, to take the stay, which is made from 3/16-in. by 18-gauge copper tube. The thoroughfare nipple is made to the same pattern as shown in the drawing on the page mentioned, but is smaller; the part which screws into the smokebox tubeplate is 5/16 in. diameter, and screwed 40 pitch, drilled 5/32 in. or No. 22, and tapped 3/16 in. by 40. The union part is made 1/4 in. diameter, and screwed 1/4 in. by 40. The assembly of all the lot, both solid and hollow, is carried out exactly as described for the larger engines.

The cross stays in the Belpaire firebox wrapper are also made from 3/16-in. copper rod, with similar nipples to those on the longitudinal stays; but owing to the upper part of the wrapper sheets having what is known as a "tumble-home," or a slope inwards towards the top, the heads of the nipples cannot take a fair bearing on the copper sheet. Therefore, a wedge-shaped washer must be placed between the head of the nipple and the wrapper, as shown by a black mark in the cross-section of the boiler recently illustrated. To ensure these heads and washers being steam-and-water-tight, it might be as well to sweat them around with solder, at the same time the firebox stays are all sweated up. As beginners and inexperienced workers may have a little trouble in tapping horizontal threads in a sloping plate, and the threads may be "a bit wonky," the sweating-up process will cancel out the "wonkiness" as far as leak ge is concerned!

Firebox Stays

The firebox stays are just the same as in the two 5-in. gauge engines, viz., of copper rod or wire 1/8 in. diameter, and screwed 1/8 in. or 5-B.A., but they are not quite so numerous, amounting to 58 in each side of the firebox, and six each in backhead and throatplate. Make a staybolt tap with pilot pin as already described, and make and fit the stays as described for "Maid" and "Minx"; but there is just one small point to note. Put the throatplate stays in horizontally, that is, parallel with the bottom of the boiler barrel and not at right-angles to the slope of the throatplate. The reason for this is, that with this fitting, the lock-nuts will come up fair against the vertical firebox tubeplate; and when the stays are headed over outside, the head will automatically form in accordance with the slope of the throatplate, whereas a nut would meet it at an angle, and require a wedge washer.

The sweating-up of the stayheads and nuts, is carried out as described for the bigger engines, and the boiler can then be tested to 160 lb. water pressure. The tender pump described for "Maid" and "Minx" will also suit "Doris's" tender, as the sides are high, and the fact that it is a little bigger than absolutely necessary, is a fault in the right direction. The use of this pump will save a special drawing, and a further description. The above jobs, staying, sweating-up, and testing, should keep "Doris" builders busy whilst I get out the drawing for the Stanier-type regulator, and the superheater details. Incidentally, the little "Black Stanier" seems to have "caught on" all right, from what I hear via correspondence and other souçes; and some good folk are, at long last, beginning to wax enthusiastic about piston-valve cylinders. Listen to what Mr. L. J. Markwick, Hon. Secretary of the Hastings S.M.E., has to say; I quote from his letter. "Up to time of writing, 'Doris' has reached the stage of frames erected, axleboxes and axles all on, pump about half-done, bogie complete except for wheels, cylinders completed and erected. The job so far has been quite O.K. and no snags. The only thing I would like to say is, *that there will be no more slide-valve cylinders where I am concerned*!

"'Doris's' cylinders were machined on a 3-in. 'Randa' lathe, and no vertical slide was used. When finished, I could blow in the steam pipe, and by operating the valve, smack the piston up against each cover. For that test, no gaskets were fitted, no piston packing, and no oil! Also, the covers were only held on by finger pressure. When the valve was placed in mid-position, it was impossible to blow anything at all through the steam-pipe. Fair enough?" I'll say it is!

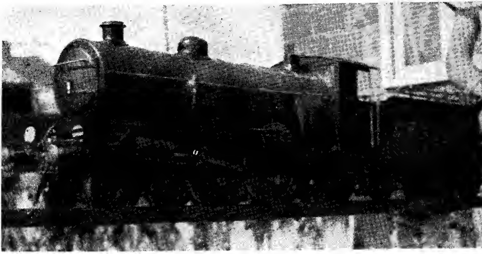
A 3½-in. Gauge Brighton "Atlantic"

Nobody can say that Mr. Markwick isn't competent to give an opinion, as he has already built a "Dyak," and a Brighton "Atlantic" engine, 424 "Beachy Head." When the former engine was started, all our friend had was an old 3-in. treadle lathe, with only a four-jaw chuck, plus a few hand tools. The necessary taps and dies, and other oddments, were purchased as needed. The engine was finished in a year; but as experience came, improvements were made, and she has run about 200 actual miles so far.

Soon after " Dyak " took the road, Mr. Markwick joined the Forces, and he says that as a Staff-Sergeant in charge of a gun repair section of a mobile workshop among the sand and flies of the Middle East, his locomotive-building experience came in mighty useful. When he returned, the first job was to get the workshop going again, and start another engine. This time something bigger, in $3\frac{1}{2}$-in. gauge, was visualised, the final decision being a L.B. & S.C.R. 4-4-2 of the second batch (Class H2) using my notes on " Maisie " as a basis. Whilst the job was in progress, a motor was fitted to the lathe, and this made things easier. The boiler brazing had to be " put out," as our friend hadn't a blowlamp big enough. The only trouble was in the valve-gear, which wouldn't come right at first, but was eventually traced to one of the eccentric-rods being 1/64 in. out, owing to the rod shifting in the lug of the strap whilst being riveted up. This was soon corrected, and the rest of the job was plain sailing.

At the Hastings club exhibition, which lasted a week, the engine was in steam for an average of eight hours per day. She covered over fourteen miles, and hauled 1,130 paying passengers, as well as many more on free trips. The only casualty was burnt firebars. In passing, that isn't anything to worry about ; we burnt out plenty of firebars in full-size, especially with good Welsh coal, and my old " Ayesha " is now trying to " do in " her tenth set !

" Beachy Head " is painted and lined in the Marsh colours, umber and black, with gold letters, this being done by a club member who is a professional sign-writer. The realistic appearance of the engine can be judged from the accompanying photo-reproduction ; the chimney isn't quite " Brighton " pattern, but that is a matter than can be remedied very easily at any time, and doesn't make any difference to the working of the engine.



Mr. L. J. Markwick's " Brighton Atlantic "

Mr. Markwick's railway is composed of 1-in. by $\frac{1}{4}$ in. steel bar in 10-ft. lengths, with tie-bars at every foot, total length 140 ft. There are two gauges, $2\frac{1}{2}$-in. and $3\frac{1}{2}$-in. The line is mounted on concrete blocks 4 ft. apart, the sections being joined by fishplates made of angle. So far, it has stood all the loads put on it, the usual being, in addition to the engine, a four-wheeled driver's car, and a bogie car 5 ft. long, carrying five adults and a dog. The engine, naturally, has never had a chance to show what she really can do, just shunting up and down ; but if and when the club's projected continuous track eventuates, our worthy friend is expecting her to uphold the L.B. & S.C.R. traditions in the manner observed among her 4-ft. $8\frac{1}{2}$-in. gauge sisters. In conclusion, I am glad to note that two junior members of the club are busy on locomotive building ; one, only 15 years of age is building " Juliet," and the other, 18, a " P. V. Baker." Old Curly wishes them both the best of good fortune in their undertakings, and offers congratulations to " Bro. Hon. Sec." on his own successful efforts.

Somebody Else Got There First !

The other day, time of writing, I received a letter from a correspondent who said he had invented a new valve-gear, and sent a drawing of it. He was full of enthusiasm, and explained that just as old Abner Baker had cut out the Walschaerts slotted links and die-blocks, so had he done the same with his improvement on the Hackworth gear. In place of the slide-shaft and die-blocks, he had substituted a bell-crank, and a radius-link. By tipping the long arm of the bell-crank up or down, the end of the radius-link could be made to describe a right- or left-handed arc, corresponding to a Hackworth slide-shaft tilted to right or left ; and by hanging the connecting-link to the end of the radius-link, and connecting the valve-spindle to it just below the fulcrum-pin, the motion could be notched up,

reversed, and the lap-and-lead movement obtained, all at one fell swoop.

Very nice, too, but I'm afraid my enthusiastic correspondent was a bit crestfallen, to say the least, when I wrote and told him that umpteen other people had thought of the same idea a long while ago; and the drawing he sent me was an almost exact copy of the layout of the " Jerry " Klug gear. As a matter of fact, most of the radial valve-gears which have been designed, are merely variations or adaptations of the same principle. For instance, the American Southern valve-gear, as is well known, has the upper end of the radius-link pivoted to a die-block working in a fixed curved and slotted link; and according to the position of the die-block in the link, so the arc in which the bottom of the radius-link swings, inclines to right or left. If the upper end were pivoted to a lever fixed to a fulcrum-pin at eccentric-rod level, the effect would be exactly the same; shifting the lever back or forward, would be equivalent to moving the die-block from one end of the stationary link, to the other.

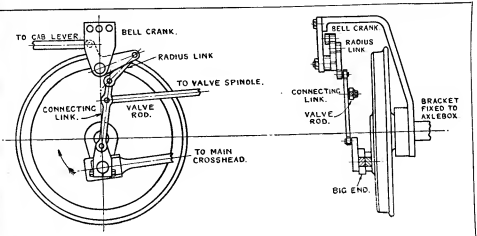
Radial valve-gears on the swinging link principle are best suited for stationary or marine engines in which the crankshaft bearings are fixed; because correct valve-setting is only possible when the crankshaft maintains a fixed relation to the position of the valve-gear. On a locomotive, this doesn't obtain at all; the swaying of the engine, the movement of the axle-boxes in the horns, the shouldering action when starting a heavy train, or pulling up a stiff grade, and running through junction points and crossing frogs, keeps the driving-axle in a constant dither, so to speak, and it doesn't maintain correct position for more than a few seconds at a time. Then springs become weak after a certain period of running, and the engine settles down on them, so that if the valve-gear was originally set correctly, the changing relationship of driving-axle and frame throws it all out. This produces the three-beats-and-a-bang effect often heard when a badly-worn engine is getting away, and makes her sound like an ancient carthorse trying to emulate a Derby winner when she is on the run.

The above calls to mind a very ingenious, albeit a bit unpractical wheeze for getting over the said trouble, which was patented by an American engineer, Mr. Edward L. Gilbert, about 22 years or so ago. I have made a drawing of it as well as I can recall the specification, and it is doubly interesting because the valve-gear itself is the " very identical " suggested by the correspondent to whom I referred at the beginning of this note. Instead of hanging the valve-gear on the frame, as is usually done in full-size practice, Mr. Gilbert suggests suspending the whole bag of tricks from a big bracket arrangement attached to the back of the driving axlebox. The relationship between valve-gear and driving-axle is thus always constant, because when the axlebox moves up and down, the whole complete valve-gear moves in unison, and the valve events are not affected in any way. Incidentally, Mr. Bulleid aimed at the same target in the valve-gear on the Southern " spam cans," as the shaft from which the valves are operated, is entirely independent of the movement of the axleboxes, being driven by chains. Whether the " game was worth the candle," in a manner of speaking, is a moot point among enginemen in general, and has been the subject of discussion in full-size locomotive circles and the engineering Press. However, the shaft on the Southern engines, is well supported, whereas the arrangement shown in the reproduced illustration herewith, looks a bit too springy for use on a full-sized locomotive, to my way of thinking; the up-and-down movement of the big-end and coupling-rod would, I should imagine, wrench the bracket and cause more movement to the whole of the valve-gear assembly, than if the gear were fitted to the frame by the usual small bracket or girder, and the axle left free. Actual experiment may prove me wrong; there's nothing like trying things out! It wouldn't be a bad wheeze to try it on a little engine, as the bracket could be made stronger in proportion, than one of full-size; and the gear is certainly simple to make and erect.

Exit the Slide-shaft

As will be seen, the valve-gear is simply a Hackworth gear with the slide-shaft and die-blocks eliminated altogether. In their place is a bell-crank, pivoted on the carrying bracket, and having a radius-link pivoted to the longer arm of the bell-crank. The end of the connecting-link is attached to the radius-link instead of the Hackworth die-block. The action is easily followed. The levers as shown, are arranged to operate an inside-admission piston-valve. In the position shown, the front port is full open. As the crankpin goes around in the direction of the arrow, the end of the connecting-link moves upward and pushes the radius-link up also; but as the other end of the latter is attached to the bell-crank, the connecting-link end will move in an arc inclined toward the back of the engine, taking the connecting-link and the valve-rod with it, and pulling the valve toward the back of the cylinder. When the crank is on the back dead-centre, the angularity of the connecting-link will be sufficient to move the valve-rod far enough back to open the back port to lead. When it arrives at top centre, the back port will be full open, as the end of the radius-link will then be at its " full-swing " position.

The engine is reversed by dropping the long end of the bell-crank to a distance below the pivot, equal to the distance it previously was above it. The arc in which the free end of the radius-link swings, is then inclined forward, directly opposite to what it was before; consequently, the port openings are also reversed, and the engine will go in the opposite direction. Any position between the two extremes of movement, shortens the travel of the valve, as the arc in which the free end of the radius-link swings, approaches the vertical position. In mid-gear, when it actually is vertical, the only movement given to the valve-rod, is by the angularity of the connecting-link, as the bottom end describes a circular movement whilst the upper end just goes up and down. The point at which the valve-rod is connected, moves just enough each side of the centre-line to open the valve to lead. The drawing is " to scale," and as reproduced, will be half-size for a $2\frac{1}{2}$-in. gauge engine having a stroke of $1\frac{1}{4}$-in. and coupled wheels $3\frac{3}{8}$ in. diameter; but



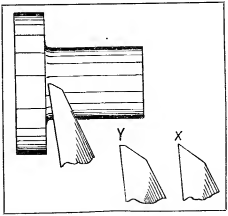
The Gilbert valve-gear

if anybody makes one up, any other size of coupled wheels can be used, as long as the layout of the gear, especially the pin centres, are kept to the proportions shown. The bracket should be made from a piece of $\frac{3}{8}$-in. by $\frac{1}{8}$-in. flat steel, and silver-soldered to the back of the driving axlebox on each side. For outside-admission slide-valves, lengthen the return-crank by $\frac{5}{16}$ in., so that the return-crankpin is 5/32 in. on the opposite side of the centre of the axle, and moves in the opposite direction to the main crankpin, instead of being in step with it. The bell-crank can be cut from $\frac{1}{8}$-in. steel plate, also the return-crank; the rest of the rods can be made from strip steel, say 3/32-in. by $\frac{1}{4}$-in. section, with pins of 3/32-in. silver-steel. All the eyes should be case-hardened. The valves are set exactly the same as with any other valve-gear, that is, with the ports just cracking when the main cranks are on the dead-centres. Slide-valve cylinders may have the valves set by sight; with piston-valve cylinders, which should always be furnished with either drain-cocks or automatic spring relief-valves, the valves may be set under air pressure, so that there is a hiss from the cock or valve exactly as the crank arrives at the dead-centre. Either a "pole" lever, or a wheel and screw, may be used to reverse and notch up the gear from the footplate, the reach-rod being connected to one of the arms of a cross shaft with a vertical arm at each end, running across the frames in two bearings of the plummer-block type, just to the rear of the bell-cranks. The vertical arms are connected by short rods to the short arms of the bell-cranks, so that they both move together when the cab reverser is operated, in the same way as the reverse-yokes of a Baker valve-gear.

A Hint on Corner Cutting

SOME turners seem to experience difficulty in cutting a corner quite square and at the same time make a neat job. Either a small ridge is formed on the face of the flange, or on the diameter of the work when picking up from the final cut. The following hint will be found useful in doing jobs of this kind.

First, avoid the common fault in grinding the tool to a point as shown in *X*, in the accompanying illustration. The point of this tool is apt to crumble and it is difficult to pick up the final cut without leaving a mark. Grind the tool with a small square flat at the point as indicated at *Y*. With this tool it is quite easy to work a good corner in the job without leaving what can be termed "pick-up" marks. Further, if the job is a small one, such as a gland, the final cuts can be taken with this tool down the flange face and along the diameter of the gland into the corner.—W. J. SAUNDERS.



A Stationary Horizontal Petrol Engine

(Adapted from the design of the "M.E." Road Roller Engine)

by R. L. A. Bell

IT was with great pleasure, not unmingled with surprise, that I learned that my little exhibit had won the "Wellingham" Cup and a bronze medal at the 1948 MODEL ENGINEER Exhibition.

As readers will realise, the basic design was originally brought out by Mr. E. T. Westbury, to form the power unit for the "M.E." Road Roller. The design intrigued me very much, being eminently practical and capable of quite an amount of modification, and would possibly make up into a perfectly good stationary job suitable for driving, say, a generator in the style one often sees in a large country house.

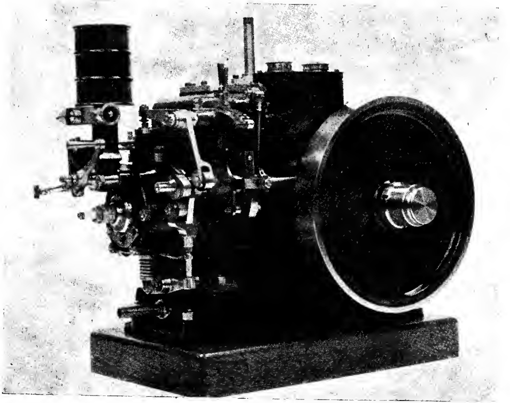
Fabrication played a large part in the making up of components, and I think that the Exchequer must have been somewhat swollen due to the large amount of tobacco that was consumed during the "thinking-out" process that preceded the making up of the large number of small parts!

The materials chosen are those which could conceivably be used in a full-sized job, and bearing surfaces and areas have been made to a maximum.

The whole of the work has been carried out on a 4¼-in. lathe, now 25 years old, and an "M.E." drilling-machine which I made up some years ago.

The crankcase casting was machined in a straightforward manner on the angle-plate, and the main-bearing bores were tackled with a boring-bar as shown in Fig. 1. After facing, one side, the bar was turned end for end to machine the opposite side, the cross-slide being used to feed the cut, as shown by arrows.

White metal was decided upon as being the correct bearing material, and the big-end was



An adaptation of the "M.E." road roller engine for stationary use

lined, using a pouring jig made up as in full-size practice. The only difference was that the bearing shel s were made extra wide to ensure that the metal was sound at the bearing ends, such extra width being afterwards machined away.

The boring and facing of the lined shells was carried out in a small jig held in the three-jaw

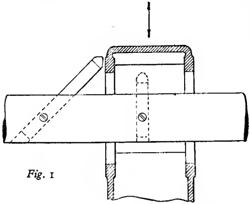


Fig. 1

chuck as shown in Fig. 2, which ensured that the bearing was perfectly true and square in its alignment.

The main bearing shells were made with extended flanges to accommodate extra metal to form thrust faces, which, after lining, were machined away to the dotted lines shown in Fig. 3. Lubrication of the thrust faces is ensured by

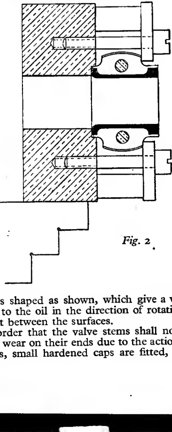


Fig. 2

grooves shaped as shown, which give a wedging action to the oil in the direction of rotation, and force it between the surfaces.

In order that the valve stems shall not suffer undue wear on their ends due to the action of the tappets, small hardened caps are fitted, and the spring caps are retained by piano-wire cotters as in Fig. 4.

It has been found in full-size practice that valve cage distortion can take place when mitre seats are employed between cage and head. A narrow flat seat was decided on and gives a perfect gas-tight joint. (Fig. 5.)

The crankshaft was made from a billet of 3 per cent. nickel steel, and has all journals of similar size ($\frac{1}{2}$ in.). The balance-weights, of cast iron, are fitted tightly to the webs in milled-out recesses, being secured by three blind headed bolts in each, two laterally and one diametrically.

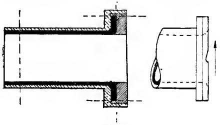


Fig. 3

The heads were afterwards machined flush.

A bronze banjo oiling ring is located by a small spigot, and fixed through the hollow crankpin by a bolt. The crankshaft timing-wheel is mounted on a sunk feather key, the whole assembly being shown in Fig. 6.

It was noticed that the timing gear-case had no provision for effectively securing the thrust

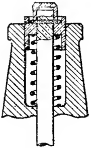


Fig. 4

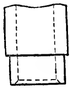


Fig. 5

cover, and so, after due cogitation, it was decided to fabricate up a steel cover and secure it with proper hexagonal-headed screws to a steel flange, fixed in turn to the front of the housing by countersunk screws. To ensure correct alignment, machining was carried out by mounting the whole casting on a stub mandrel in the camshaft bore, boring first the flange after mounting by its screws, and then the cover. The latter was bored taper, a steel boss made to fit, brazed in, and finally machined in position.

Thrust is taken by a pair of hardened pads. The camshaft timing-wheel is located by a pin key registering with a hole in the camshaft collar. Fig. 7 illustrates the assembly.

The timing-gears were a real headache, and contributed not a small amount to the tobacco

account. The job was finally done quite satisfactorily on a small rig made up for the job, using the principle of master helices rotated against a fixed stop. As the diameter of the master was considerably larger than the pitch diameter of the gears to be cut, what seemed like reams of extra calculation had to be done. Two separate, but interchangeable cams were made, one for each gear, and the blanks turned from "UBAS" casehardening steel were successfully cut, together with a spare pair, without removing the rig from the lathe.

At this juncture I would like to extend my thanks to two of my friends, Mr. C. D. Sweet for the loan of the necessary formulae, and Mr. B. Langdon for the loan of the set of 36 D.P. involute cutters with which the teeth were finally cut. The gears have 9 and 18 teeth in crank- and camshaft respectively, and after cutting the keyway in the former and drilling the hole in the latter, they were casehardened.

Fig. 8 shows in half section the fuel priming chamber containing a removable gauze filter, and fitted with an airtight cap. The fuel tank, being situated some little distance below it, priming the chamber ensures that fuel reaches the jet quickly.

The stage was now reached where the governor gear was contemplated, but how to arrange it was a question that called for the assistance of yet more tobacco! Really, at times the air in my tiny shop was thick! The problem was to make use of the highest speed shaft (the crankshaft) in order to employ the smallest weights, at the same time to use springs of reasonable size, the whole to be in keeping with a good general appearance and not to look clumsy and out of scale.

Fig. 9 shows how this was done, and by paring down the webs on the main bearing, room was obtained

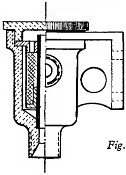


Fig. 8

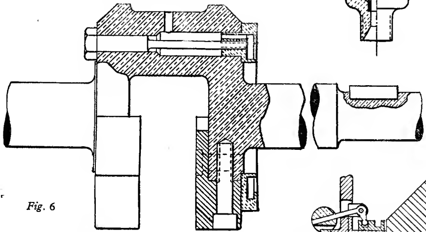


Fig. 6

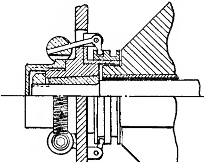


Fig. 9

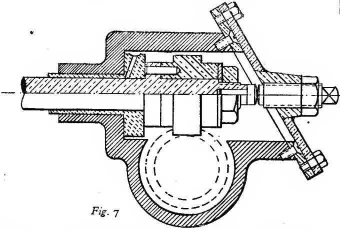


Fig. 7

to accommodate a steel sleeve spigoted into the inner face of one flywheel web, and fixed thereto with six bolts and nuts. On this sleeve, slides a cast-iron grooved sleeve, actuated by the toes of the two governor ball arms pivoted in lugs brazed on the flange of the fixed sleeve.

the governor throttle which is housed within the main throttle which normally is fully open but serves to control speed below that at which the governor is set.

Fig. 13 is the linkage diagram showing the fixed and movable points.

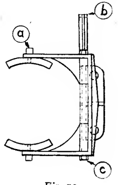


Fig. 10

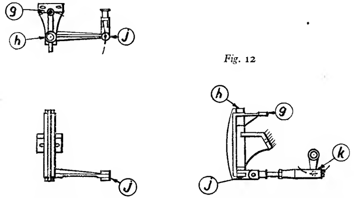


Fig. 12

These arms move in radial slots cut through the wheel web, and to their outer ends are fixed the weights.

The weights are held inwards, when stationary, by a pair of springs which stretch under the action of centrifugal force when running at the governed speed. Thus it can be seen that the grooved sleeve moves axially as load is varied. A small 10 B.A. pin fixed radially in the outer groove comes against one toe and serves to positively drive the sleeve.

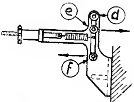


Fig. 11

The whole governor mechanism had to possess the minimum of friction, and to get the spring tensions correct, and to ensure that no tight spots were in evidence, the mechanism was tested on a small variable speed d.c. electric motor, and proved very sensitive.

Fig. 14 shows views of the mechanical lubricator, driven from an eccentric on the camshaft, *via* a rocking lever and ratchet motion.

The system works on the dry-sump principle, and the scavenge pump is 50 per cent. greater in area than the feed pump, as is also the respective external piping. The plungers are self-aligning in the yoke and work in bronze-lined bores. The valve seats are removable and are also of bronze. The main pump body is fabricated from brass, silver-soldered together, and can be removed bodily from the base of the tank by removing ten 10 B.A. hexagonal-head screws.

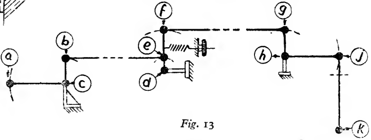


Fig. 13

The inner groove contains two fixed shoes mounted on a hinged fabricated steel bracket (Fig. 10) and transmits the axial motion of the grooved sleeve to longitudinal motion at the fork joint " b."

A 2-1 lever is mounted as shown in Fig. 11 to which is attached a bias spring and adjuster, by which the speed can be varied while running. Fig. 12 shows views of how the linkage is taken " round the corner " at the rear end to operate

A sight-feed glass is fitted, the dome being made of thin plastic sheet moulded under heat in a specially made die. This sight feed is a check on the oil being fed to the big end bearing and is in the *suction* side of the feed pump. By virtue of the fact that the suction port is open for only a short period at the top of the stroke, it has the effect of definitely sucking the oil from the sight feed bowl at the same time as one fresh drop appears at the drip orifice. There is thus no

accumulation of oil in the bowl. A small air vent is provided in the tank to prevent the pumping action of the air enclosed.

The larger pump receives its feed from the crankcase, and delivers its oil to a drip orifice placed just below the transparent window in the filler cap.

bolt bosses, tray edge, and top machining pads, the whole being silver-soldered and afterwards machined, as if it were a casting.

As my stock of small nuts consisted of a meagre few at the commencement of the job, all nuts except about half a dozen, all studs and bolts, split cotters, etc., were home-produced, and

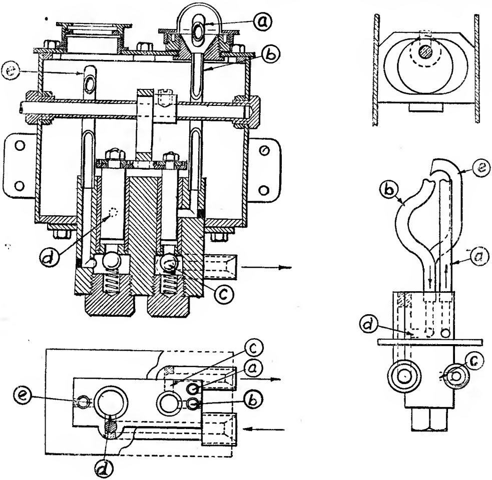


Fig. 14

On test, this lubricator sucked oil from a height of over 6 in. and the delivery pressure was more than could be held by the thumb when pressed over the outlet connection.

Study of the lettered portions of the various views will help to "sort out" a rather complicated-looking box of tricks. The crankcase release valve ensures that there is always a slight vacuum in the crankcase while running, thus preventing oil from being blown from bearings, etc.

The foregoing, I think, covers the modifications and additions made to the original design, except the bedplate, which is fabricated from about 23 pieces, including internal ribs, herewith is a useful tip to prevent them being spanner-marked—lightly caseharden them. Cast-iron piston rings were also home-made, being duly ground to size and the sides lapped.

I cannot conclude without a word of thanks to the promoters of the finest hobby in the world—Model Engineering, by whom I mean the Staff of THE MODEL ENGINEER, for the fine Exhibition staged in 1948, and last, but by no means least, to Col. H. J. Wellingham, whose handsome Trophy is now my treasured possession. I have already had a broad hint from my wife to the effect that the symmetry of the mantelshelf is upset by a cup on one side only, so who knows? One day I hope, the balance will be restored.

Name- and Number-Plates

Patterns and finished plates

THE cast plates forming the subject-matter of this article were produced for a $7\frac{1}{4}$-in. gauge locomotive and, therefore, are of relatively large size. The name-plate measures $5\frac{1}{8}$ in. by $\frac{11}{16}$ in. and the number plate $3\frac{1}{16}$ in. by 1 in.

The production of name-plates and the like is often considered an incubus. Fears are groundless, however, since very fine plates may be produced by the photo-engraving process, after reduction from an enlarged drawing. In the present case, one was not modelling from a prototype; and as experimental cast plates would be inexpensive, it was decided to obtain some before, if needs be, attempting the photo-engraving process. When using normal casting methods, one hardly expects a result free from blemishes. That which was obtained is shown by the photograph. But, due allowance should be made for the hard oblique lighting used for the photography, which is a very severe test. Under normal lighting, the plates look almost perfect.

To avoid muttered imprecations, it was essential that very clean castings be obtained, and the problem was where to procure them. At the time of the experiment, goods of this nature were still difficult to obtain; and when the order for castings had been placed, the advent of a fuel crisis appeared to ruin the venture.

Good clean metal patterns were the first step to ensure any success that may be forthcoming. These were made to utilise pattern-maker's letters obtained from Messrs. Phillips Ltd., of Pomeroy Street, London, S.E.14. (The address conjures up visions of Geo. England's locomotive works.) It should be noted that there are two kinds of letters and figures—flat and raised. The latter are of vee-section and their height is measured from ridge to ridge; whereas the flat kind are measured overall. The raised form of character, designated "style 4" was used to obtain a good draw from the mould, the trade measurements being $\frac{3}{8}$ in. for the letters and $\frac{5}{8}$ in. for the figures. Of course, the castings obtained were subsequently milled, and the process produced flat l tters and figures.

When the characters came to hand, they were arranged so that the dimensions of the heavy-gauge tinned-iron backplates could be determined. The characters were then placed aside. Next, the plates were shaped and provided with a border of suitable wire, filed to vee-section and soldered in place with tinman's solder having a fairly high melting-point. Note particularly, that the characters had not, as yet, been attached to the plates; nor were they near them during the soldering process.

As the characters were of soft alloy, a very low melting-point solder was necessary for fixing them to the plates. Shellac would have provided an alternative adhesive. A eutectic solder was preferred, and use was actually made of "Fusible Solder No. 9" and "Frysol Blackband Brand" soldering fluid. Both are products of Messrs Fry's Metal Foundries Ltd. The characters were applied when the backplate was resting on a slightly warmed surface, a hint the writer gleaned from a chum very adept at soldering, and who kindly attended to the "differential soldering" with a prestidigation the writer can never hope to acquire.

To assist the foundryman to remove the patterns from the mould, holes were drilled through the backplates at the location desired for the 8-B.A. fixing screws. As will be seen from the illustrations, the holes in the patterns were of smaller diameter than required for the screws passing through the actual plates.

The patterns were pleasing enough, but their exhibition only brought forth doubts of success. Anyway, Dick Simmonds, to whom the casting was entrusted, had no doubts about the matter. He promptly delivered gunmetal castings of the degree of excellence shown by the photographs. Luck had followed the job so far, and there was no reason why it should not continue, for the little milling-machine upon which the plates were machined came from Pomeroy Street, where, no doubt, many a locomotive plate had been seen.

By means of screws passing through the holes in the cast plates, the castings were fastened to a strip of wood held in a machine-vice. When the plates were to the required thickness, they were taken to the bench, where their edges were smoothed and faces polished. The painting of the backgrounds for the characters was the final stage in production.—H.J.H.

Exhibits at Ipswich

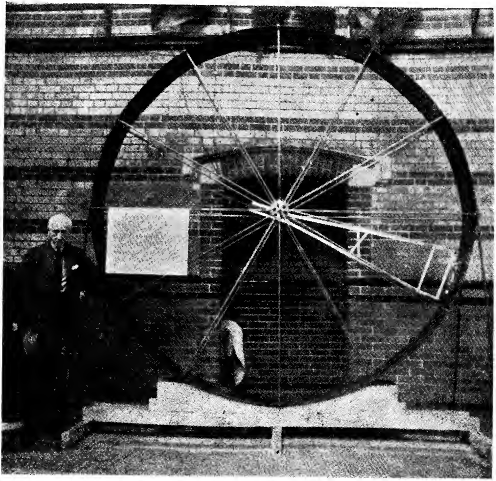
ANOTHER successful exhibition was held recently at the Baths Hall, Ipswich, by the Ipswich and District Society of Model and Experimental Engineers. A yearly exhibition calls for great effort in producing sufficient models which have not been previously shown. Our members and an equal number of outsiders produced a show which the judges, Mr. Westbury and Mr. Bowness, described as of a higher quality than in previous years.

Our President, Mr. Lewis, designed a hoop track to conserve floor space. This was 10 ft. diameter and 18 in. wide. With some assistance, which was beyond our workshop equipment, our members built this track in one month, and this was duly transferred to the exhibition. With a K model car, we were able to demonstrate the power of a Jetex 350 outfit, which was a huge success.

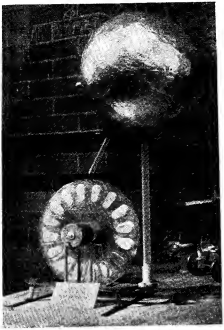
A cup was offered for the most outstanding model. This was won by Mr. Ostler with his petrol-driven unit to mount on the front of a bicycle and drive the front wheel.

The Ipswich Model Aeroplane Club had a stand and demonstrated free flying with a micro-film plane. Also a Jetex-driven plane, hanging from overhead supports and centrally located, gave some more examples of the power of Jetex.

A fully-equipped workshop was in operation. Also a miniature railway with electric and steam locomotives working, to the delight of the younger people.



The vertical loop track for testing model racing cars



An experimental motor-driven Wimshurst machine, by Mr. Lewis

Mr. Ostler's 25-c.c. auto-cycle unit

Nearly 4,000 people attended the exhibition, which was opened by Mr. E. P. Shurety. The prizes were given by Mr. D. Braid, whom we regretfully lost as Secretary of our Society earlier in the year owing to removal to London.

The Royal Navy showed some fine examples of work from the Artificers' Training Establishment, Torpoint, Cornwall.

A "Juggernaut" jet engine, mounted upon a car chassis, was demonstrated, but the power was too great to allow it to be trusted unanchored. The astounding noise created great excitement.

The Model Power Boat Association

The following claims for records in A, B, and C classes have been approved by the committee of the M.P.B.A. All these records have been set up during this year.

Class A

Mr. K. G. Williams (Bournville) *Faro*. 500 yd.: Speed, 51.1 m.p.h.; 1,800 yd.: Speed, 48.7 m.p.h.

Class B

Mr. Mitchell (Runcorn) *Beta*. 500 yd.: Speed, 44.5 m.p.h.

Mr. Jutton (Guildford) *Vesta II*. 300 yd.: Speed, 43.9 m.p.h.

Class C

Mr. G. H. Stone (Malden) *Lady Babs II*. 500 yd.: Speed, 70.1 m.p.h.; 1,800 yd.: Speed, 67.8 m.p.h.

Mr. K. G. Williams' boat *Faro* is a very well known performer at regattas. Originally built in 1936, it is fitted with a 30 c.c. overhead valve, 4-stroke engine, designed and built by the owner. The hull is a single-step hydroplane, 40 in. long 12 in. beam.

Mr. Mitchell's boat *Beta* has been built recently and this, too, has a 4-stroke engine with overhead valves, built by the owner, the capacity in this case being 15 c.c. It is also noteworthy in that it is fitted with a very efficient silencer. The hull is built of $\frac{1}{16}$-in. plywood and is 28 in. long by $10\frac{1}{4}$ in. beam.

Mr. Jutton's boat *Vesta II* is a flash steamer of fairly conventional layout, fitted with a surface propeller, and this season has gained many first places at regattas.

Mr. Stone's boat *Lady Babs II* is a twin float hydroplane of unusual design, built of wood, having a surface propeller and is fitted with a "Dooling" engine. Ignition is by glow-plug. The capacity of the engine is 10 c.c.